

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES DESIGN AND FABRICATION OF AUTOMATIC FLUSHING SYSTEM

Swapnil Suresh Bhadang

Assistance Professor, Department of Mechanical Engineering, Mauli College of Engineering & Technology, Shegaon, India

ABSTRACT

Now a days, the human waste disposal is done with the help of a flush in urinals and toilets by the use of water through a drainage pipe to other location. A series of urinal-toilets are fitted at public places such as bus stands, railway stations, multiplexes, educational institutes, offices, airports, malls, commercial offices etc. Most of them have manual flushing systems like pull chain, push button, trigger etc. However, germs and bacteria can spread by these of such systems. Thus, people avoid to use flush or if used, it can cause wastage of water. Now a days, laser or infrared sensor operated flushes is also used in the places of high commercial value and importance but are expensive and required continuous O&M. Hence, unhygienic conditions can occur if the sanitary facility may remain un-flushed which leads to bad odor. Therefore, a low cost automatic flushing system is required which can flush the right-controlled amount of water and avoid direct contact thus conserving water as well as maintaining personal hygiene and sanitation. The present invention relates to a specially designed mechanical automatic urinal-toilet flusher and a mechanism, which utilizes the weight load/pressure of the person using the urinal-toilet for automatic flushing the toilet with the specified or measured quantity of water to prevent odors, soil drain and scale buildup.

Keywords: Automatic Flushing, Linkages, Sanitation etc.

I. INTRODUCTION

A flush toilet is that in which disposal of human excreta is done by using water to flush it through a drainpipe to another location for disposal, thus maintaining a separation between humans and their excreta. Flush toilets can be designed for sitting like "Western" toilets. A flush toilet is different from a urinal, which is designed to handle only liquid waste, which can be used for personal cleansing after toilet use. Flush Valves are generally available in come in two different forms: Manual (lever or button) and Automatic. The purpose of the valve is to flush the waste away into your sewer system, typically from a urinal or toilet. Over the last several years, public awareness of personal hygiene and water conservation is a major issue that has caused manufacturers of sanitary facility and hygiene devices to develop automatic actuators for sanitary facilities such as toilets and urinals.

The main objective of using such devices is to control the amount of flush water used to eliminate waste automatically and in the process eliminate human contact with the surfaces that may contain disease spreading bacteria. At present, most of the toilets and urinal flush devices are operated by a water control valve which includes a manually operable flush handle adapted to be gripped and moved by a user. However, those manually operated valve actuation devices have many problems and can lead to diseases. Thus users avoid to touch / use the flush button. Therefore, the sanitary facility may remain unflushed which increases the unsanitary conditions, and fouling the atmosphere in the facility. Also, every time a user flushes a standard toilet a large volume of water is wasted. Thus there is a great need for a low cost automatic flushing apparatus which conserving water as well as maintaining personal hygiene and sanitation.

Flush meters have become permanent staples in most public restrooms due to their high water-efficiency compared to standard gravity operated toilets found in most residential homes. The present invention discloses an automatic flusher with dual-valve pipe mechanism actuated by a mechanical platform, which can provide an efficient and cheap flushing system.

II. OBJECTIVES

- To provide a clean and hygienic environment near urinals at the public restrooms by making it to get flushed automatically using mechanical linkages.
- To make less use of water for flushing purpose.
- To prevent the unnecessary wastage of water and save the water resources of our future generation.
- To avoid the use of external power source for urinal flushing.
- To provide a cheapest urinal flushing.

III. LITERATURE REVIEW

A urinal is predominantly used by males which is a sanitary plumbing fixture for urination only. It is like a container with drainage and automatic or manual flushing, with or without flush water as is the case for waterless urinals.

The different types of urinals are often intended to be utilized from a standing position for single users or for multiple users, (rather than squatting or sitting). But designs which are intended to be used with other postures often exist. It can also be like a small building or other structure containing these fixtures or it can also be like a small container in which urine can be collected for medical analysis where access to toilet facilities is not possible such as in small aircraft and for the bedridden patients. Generally, the body posture for users of urinals is in standing position.

The public urinals use a water flushing system to rinse urine from the bowl of the device to prevent foul odors. Various methods are used to trigger the flushing as explained follows.

1. Manual handles:

Every urinal is having a button or short lever to activate the flush, with users expected to operate it as they leave. It is the most efficient systems which is directly controlled system. Sometimes, urinals with foot-activated flushing systems are found in high-traffic areas. These systems are having a button set into the floor or a pedal on the wall at ankle height.

However, few urinals are equipped with water-saving "dual-flush" handles, which use half as much water when pushed upwards, and operate a standard full flush when pressed downwards. The handles are often color-coded green to alert users to this feature.

2. Timed flush:

In countries like UK, France, Germany etc., the traditional system is a timed flush that operates automatically at regular intervals. A group of ten or more urinals is connected to a single overhead cistern, which contains the timing mechanism. When the valve opens, a constant drip-feed of water slowly fills the cistern, until a tipping point is reached and all the urinals in the group are flushed. Electronic controllers which perform the same function are also used.

This system attempts to install manual flushes to save water and does not require any action from its users. But because activating the flush is not habitual, users ignore them not through deliberate laziness or fear of infection.

3. Door-regulated flush:

It is an older method of flushing to save water, and operates only when the room has been used. At the door frame of the restroom, a push-button switch is mounted and triggers the flush valve for all restroom urinals every time the door is opened. It provides reasonable flushing action without wasting excessive amounts of water when the restroom is not being used. Door-regulated flush method requires a spring-operated automatic door closer, since the flush mechanism only operates when the restroom door opens.

4. Automatic flush:

The problems of previous approaches solved by Electronic automatic flush system and are common in new installations. When the urinal has been used, a passive infrared sensor identifies it by detecting when someone has stood in front of it and moved away. After that, it activates the flush. There is also a small override button which allows optional manual flushing.

In existing systems, automatic flush facilities can be retrofitted. A suitably designed self-contained electronic valve can be replaced with the handle-operated valves of a manual system, often battery-powered to avoid the need to add cables. Older timed flush installations can add a device which regulates the flow of water to the cistern based on the overall activity detected in the room.

IV. EXPERIMENTAL SET UP

Types of components used and their functions

1. Primary tank
2. Storage tank or flushing tank
3. Bush valve
4. Flushing Bush valve
5. Urinal
6. Pedestal
7. Base
8. Lever and linkages
9. Spring



Fig 1.1: Fabricated model of Automatic Flushing System

Working:

The construction and working process of the automatic urinal flushing system can be divided in following three stages:

- a. Initial stage.
- b. Secondary stage.
- c. Final stage.

Initial stage:

During the initial stage of operation, the urinal is at rest position and the pedestal is at its normal position. The Bush valve at the top would be in closed condition and the flushing Bush valve at the bottom would be in open condition. The water from the primary storagetank is not able to enter the secondary tank. During this stage of operation of automatic flushing system, the closed coil spring remain in its normal closed condition

Highlights:

Bush valve – closed condition
 Flushing bush valve – open condition

Secondary stage:

At the secondary stage of operation, the person who needs to pass the urine enters the urinal and stands into the pedestal of the urinal flushing system. By the application of load on the pedestal, the lever gets pressed downwards and the pedestal gets inclined. This causes the upward movement of the linkage causing the closure of the flushing bush valve and the opening of the Bush valve. Thus, the water from the primary tank gets into the secondary and temporary storage tank through the Bush valve. Till the person urinates in the urinal, the water gets filled in the secondary tank. The water do not get flushed into the urinal from the secondary tank as the flushing bush valve would be closed. At this stage of operation, the spring remains in expanded condition.

Highlights:

Bush valve – open condition.
 Flushing bush valve – closed condition.

Final stage:

During the final stage of the operation, the person gets down from the pedestal after urinating. Due to contraction of the closed coil spring, the pedestal returns to its initial original position so that the level gets returned to its initial position. During this action of the lever, the bush valve gets closed and the flushing bush valve gets opened. This would cause the flushing of the urinal by the water from the secondary storage tank through the flushing bush valve. The water supply to the secondary storage tank from the primary tank would be stopped as the bush valve gets closed

Highlights:

Bush valve – closed condition.
 Flushing bush valve – open condition.

Thus, water gets flushed into the urinal after the usage of the urinal automatically. Water do not get wasted continuously in this urinal. Even when the person stands in the urinal for a much longer time, water does not get flushed continuously.

Only limited amount of water would be flushed into the urinal, irrespective of the time that the person takes to urinate, into the urinal. Only minimum amount of water would be capable in the secondary tank and only that volume of water would be made to flush into the urinal, always irrespective of the time that the person takes for urinating.

V. RESULTS & DISCUSSION

In this work, project an automated toilet flushing mechanism was designed and fabricated, which saves the water. Now a days, there is scarcity of water. Therefore, this system will be helpulto save the waterThe advantages of this system over Manual Urinal Flushing system are as follows.

Water saving

The highest environmental benefit, which can be achieved for flushing urinals, is related to water saving, as out of the total water usage in household maximum 15- 20% is used for flushing the urinals. This system reduces 60% of water use in daily usage in flushing urinals than Manual Urinal Flushing system. Due to water saving, there are less environmental impacts related to water supply and wastewater treatment. Along with saving of water there are ultimate results are as follows:

- Reduce emission of greenhouse gases and pollution of water bodies.
- Foster regional competitiveness amongst the sanitary equipment manufacturers for low cost, better quality and environmental friendly product.
- Expenditure spends on the health –illness arising out of the poor sanitation by the individual in society will be directly saved.
- Conserve electricity used for pumping water & treating wastewater.
- Energy saving and lower related air emissions, lower water pollution in economic savings for the users with direct cost savings.
- Usage of water in this system is 1 litre to 2.5 litres.
- Improvement in the health hygiene and sanitation field related to urinal-toilets.
- Touch-contact free flusher eliminates the exposure to disease-causing bacteria that can occur when users operate manual flush fixtures.

First of all, we data was collected and set up was designed. Then, experimentation was done and observations were noted. Calculation were done as per the consumption of water. It was concluded that the hygienic problem due to manual flushing system was minimized. The most important factor is that there is no power required to operate this system ultimately there is a saving of energy.

System	Mechanical flusher	High Tech flusher	Invented flusher
Water use/ flush(lit)	1-2.5	2-3	Customized vol.
Water efficient O&M	Moderated	High	Low
Consumable Requirement	Low	High	Low
Power	No	Yes	No
Price	Low	high	Low
Common Problems	Water Wastage	Need High Supervision	Nil

Comparison with other systems:-

VI. CONCLUSION

This mechanical flusher is very useful for flushing the public urinal without the involvement of the human being. It automatically flush the urinal with less time and with less water consumption. This machine is very fast work and does not require maintenance. Use of such mechanically operated flush avoid spreading of germs and bacteria. Therefore, the sanitary facility may flushed and reduced unhygienic conditions and foul smell. It ensures the compulsory, regular and un-intentional flushing of the urinal without any direct hand contact of the user

to the flush and also conserve water. It is simple and cheap mechanism, which can be fitted to new as well as existing water pipe line of the urinal.

Thus, the present innovation provides the low cost alternative for the automatic compulsory regular and unintentional and hands-free flushing of urinal-toilets which not only results in the development and facilitation of the low cost clean and hygienic but also results in saving of precious natural resources like water and energy. More importantly in view of the recently launched “SWACH BHARAT MISSION”, by Honorable Prime Minister of India with a special focus on sanitation and hygiene in rural as well as urban areas, especially for the economically backward population of India, this innovation has a great societal importance and potential for replication within India.

REFERENCES

1. *A Snapshot of Drinking Water and Sanitation in WHO South-East Asia Region - A regional perspective based on new data from the WHO/UNICEF Joint Monitoring Programmed for Water Supply and Sanitation WHO/UNICEF, August 2014.*
2. *Chariar V. M. and Sakhivel S Ramesh. Indian Institute of Technology (IIT) Delhi. Report on Waterless Urinal A Resource book.*
3. *Genty A. 2013, Development of EU Ecolabel and GPP criteria for flushing Toilets and Urinals- Technical Report, 2013.*
4. *R.S. Khurmi & J.K. Gupta, Theory of Machines, 14th edition, S. Chand publication, Delhi, 2005,pp (75-86).*
5. *R.S. KHURMI & J.K. Gupta, Machine Design, 1st edition, S. Chand publication.*
6. *Dr. R. K. Bansal, Fluid Mechanics & Hyraulic Machines, 9th edition, Lakshmi publication, Delhi , 2010,pp (993-995).*
7. *Book of machine design by B.D. Shiwalkar*